ANALYZING THE EFFECTS OF DIFFERENT SIGNS TO INCREASE THE OPPORTUNITY OF DESIGNATED VAN ACCESSIBLE PARKING SPACES

By

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Submitted to the graduate degree program in Applied Behavioral Science and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Master of Arts.

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Abstract

Designated van accessible parking spaces are often occupied by non-ramp or lift equipped vehicles (NRLEV) with accessible parking permits. This causes inconvenience, safety concerns, and reduced opportunity of parking spaces for ramp or lift equipped vehicles (RLEV). The researcher conducted a study to obtain social validity using mixed methods including a focus group with RLEV users and brief interviews with NRLEV users to validate if this was a problem worth addressing. To learn more about this issue, the researchers conducted a multi-component analysis across settings with imbedded reversal single subject design. The purpose of the multi-component analysis was to examine a differential comparison between the standard van sign versus intervention signs (pictorial representation of a ramp-equipped van plus messages), to determine which is more effective to signal NRLEV users not to park in designated van accessible spaces. The reversal design was used to test and validate the most effective intervention sign effects identified during the multi-component analysis. The results based on observations showed that the interventions signs could moderately reduce the chances of NRLEV users parking in the designated van accessible parking spaces. Implications of these research findings are discussed and recommendations for changes in state and national accessible parking policies are suggested.

Keywords: accessible parking, handicapped parking, designated van accessible parking space, ramp or lift equipped vehicles

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Introduction

Driving in America is associated with autonomy and independence, and it is an important link to other social activities (Mann, McCarthy, Wu, & Tomita, 2005). The same is true for people with disabilities. The US Census (2010) reports that 54 million Americans have disabilities, representing around 19% of the civilian, non-institutionalized population. Many of these Americans are able to drive and use accessible parking permits, which can help facilitate their independence and participation in the community. Chang, Coster, and Helfrich (2013) defined community participation as "active involvement in activities that are intrinsically social and either occur outside the home or are part of a nondomestic role" (p. 771). The National Institute on Disability and Rehabilitation Research (NIDRR) lists community participation as a key area of emphasis in its 2013-2017 Long-Range Plan (2013). The biopsychosocial model of disability emphasizes environmental factors and their contribution to disablement. These factors are external to individual's personal abilities and competencies and can influence their ability to carry out day-to-day tasks and, ultimately, their level of community participation (WHO, 2001). Legislation such as The Americans with Disabilities Act (ADA) has resulted in federal regulations such as the Americans with Disabilities Accessibility Guidelines (ADAAG) (2004) and 2010 ADA Standards for Accessible Design, developed under the guidance of the US Access Board. This legislation and regulation have been promoting accessibility of the built environment for people with disabilities to create barrier free environments, including equal access to public facilities, employment and transportation, including greater access for parking personal vehicles in accessible parking spaces.

For example, the ADAAG requires businesses to restripe parking lots to provide accessible parking spaces, which should have at least a 60-inch-wide access aisle located

adjacent to the designated parking space. These accessible parking spaces are identified with both an upright and a ground-marked sign. In contrast, van-accessible designated parking spaces require more stringent guidelines than accessible parking spaces, including: (a) wider access aisle (96") to accommodate a wheelchair lift; (b) increased vertical clearance to accommodate van heights, and an additional sign designating the parking space as "van accessible," which should be mounted so that the lower edge of the sign is at least five feet above the ground. There are two exemptions related to signs: parking lots that have four or fewer total spaces or residential facilities where parking spaces are assigned to specific dwelling units.

Earlier research focused on drivers parking in accessible parking spaces without displaying a tag or license, and interventions to deter these violations. Matthews (1981) conducted a study on what was then called "handicapped parking", before the ADA was passed. Results showed that the rate of illegal parking or violation of accessible parking was high (76.1%). Jason and Jung (1984) evaluated strategies to reduce non-disabled drivers from parking in handicapped parking spaces. They found that vertical signs plus ground markings were more effective than ground markings alone in deterring violators. Suarez de Balcazar, Fawcett and Balcazar (1988) found that the combined effect of upright signs and police enforcement provided the greatest deterrent to illegally parking in handicapped spaces. White, Jones, Ulicny, Powell and Matthews (1988) found that handicapped parking signs with a warning indicating the consequences for violating handicapped parking ordinances were more effective than standard signs in deterring unauthorized vehicles from parking in the handicapped parking spaces.

Six accessible parking studies were conducted in a North Carolina community to examine characteristics of violators and the effects of signage and social sanctions on violation rates. Allred and Cope (1990) studied the personal and behavioral characteristics of accessible parking

violators and determined that rates were highest among male college-age students who were smokers, frequent drinkers, and who drove after drinking. Situational conditions related to violations included type of sign, weather, and available rewards or punishments. Cope and Allred (1990) found that more violations occurred during rainy weather and among young drivers. Cope, Allred, and Morsel (1991) conducted a follow-up study to determine the effects of signs and social sanctions. The results indicated that the ground sign plus the vertical sign and message sign containing the social sanction, "Warning this space watched by concerned citizens" was found to work best in reducing violations. Cope and Allred (1991) replicated and extended the Cope et al. (1991) study by adding a message dispenser device that announced community involvement and dispensed politely worded reminder notes. The results indicated the vertical sign plus the message dispenser had the most intervention effects. Cope, Lanier and Allred (1995) conducted an experimental study to examine which factor was more influential, the content of an additional sign or the novelty value of an additional sign. These researchers used similar signs with different content, for example, stating that the accessible space was under watch during two different time periods. The greatest reduction in illegal parking occurred during the observation periods consistent with the times specified on the message sign, which indicated that illegal parking was probably controlled more by the content of the message than by the increased salience resulting from the addition of a secondary message sign. Estes, Moore, and Dolezal (2004) reported an observed violation rate of 15.2% and indicated that the violators were found to be more likely to use accessible parking spaces during rush hour time, (i.e., between the hours of 4:30-6:30 p.m.).

Fletcher (1995) observed that violators were more likely to be male, non-white, and young. Taylor (1998) conducted an experimental study on the effects of different bystanders in

reducing violations of handicapped parking spaces. He found out that the presence of actors with a physical disability would result in a lowered rate of handicapped parking violations. Fletcher (2001) indicated that guilt was a factor in the illegal use of handicapped parking spaces, based on the observation that the violators were more likely to park in the least conspicuous parking spaces.

To summarize these studies from 1981-2004, the literature suggests that accessible parking violation rates have decreased considerably over the past 20 years by employing effective strategies such as using both vertical and the ground marked signs and posting of potential consequences for violation of handicapped parking ordinances. Another large factor was the introduction of the ADAAG regulations and enforcement as a result of the ADA.

More recently another accessible parking problem is emerging, (i.e., when the designated van accessible parking spaces are used by NRLEV with accessible parking permits). Increasingly social media is broadcasting how frustrating it is for RLEV users to see the designated van accessible parking spots occupied by cars with an accessible parking placard, parked right next to an unoccupied standard accessible parking spot (Zielinski, 2010; Vogel, 2012). As the group of RLEV users grow because of the needs of a society aging into disability and increased affordability of RLEV, the problem will be further exacerbated in the future.

Earlier studies about the violation of accessible parking provide some methodological approaches to address this problem. The intervention studies on violation of accessible parking have focused on manipulating antecedent stimulus (e.g., vertical signs) or consequence of the violation behavior (e.g., police enforcement). Because it is legal for NRLEV users with accessible parking permits to use the designated van accessible parking spaces, it was not possible for the study to intervene on the consequence of the target behavior. In other words, the

current study would mainly focus on intervening on antecedent stimuli, which were used to modify existing vertical signs with different messages. In addition, direct observation has been used in most studies on accessible parking violations. Trained observers could collect objective data without detection or intrusion. Finally, previous research suggests a single subject design could be used to evaluate different intervention strategies.

Besides the quantitative perspective, qualitative research methods can also provide important information to address this issue. Qualitative research methods are widely applied in social science study. It is best used to address certain types of social research, such as identifying factors that influence an outcome, the utility of an intervention, understanding the best predictors of outcomes, testing a theory or explanation, and exploring a concept or phenomenon without little previous research (Creswell, 2013). It can be very useful when the research topic is new and has never been addressed with a certain sample or group of people (Morse, 1991), which is the case of the current study. Qualitative research method has different approaches or strategies, such as ethnographies, grounded theory, case studies, narrative research and phenomenological research (Creswell, 2013). Phenomenological approach fits best for the features of the current study to get a better understanding of the problem as viewed by those most affected by it. As indicated by Lester (1999), "the purpose of the phenomenological approach is to illuminate the specific, to identify phenomena through how they are perceived by the actors in a situation" (p. 1). Phenomenology emphasizes the study of individual experience, and gathers "deep" information and perceptions through inductive, qualitative methods such as interviews, discussions and participant observation (Lester, 1999).

The adoption of both qualitative and quantitative research methods in a single study makes this study a mixed methods approach. Mixed methods approach triangulates data sources

(Jick, 1979), and the results from one method can help develop or inform the other method (Greene, Caracelli, & Graham, 1989). With this approach, one method can be nested within another method to provide insight into different levels or units of analysis (Tashakkori & Teddlie, 1998). Together these mixed methods can serve a larger, transformative purpose to change and advocate for marginalized groups, such as ethnical and racia1 minorities and people with disabilities (Mertens, 2003). The mixed methods research has two different strategies or procedures, sequential procedures and concurrent procedures (Johnson, & Onwuegbuzie, 2004). The sequential procedures serve best for the current study as it may involve beginning with a qualitative method for exploratory purposes and following with a quantitative study to apply and expand on the findings from the qualitative method.

The qualitative studies would also help establish the social validity of the intervention study. As Wolf (1978) suggested, researchers should obtain social validity regarding the social significance of the goals, procedures and of the effects or outcomes.

By using the mixed methods research approach, the researchers hope to achieve the following objectives: (a) to investigate whether designated van accessible parking spaces being taken by NRLEV users with an accessible parking permit is a problem that needs to be addressed and whether modifying the current sign for van accessible parking is an appropriate intervention, (b) to evaluate whether current signs for designated van accessible parking are salient enough so that drivers with accessible parking permits with NRLEVs allow ramp or lift equipped vehicles to park in their designated van accessible spaces. We hypothesize that the current designated van accessible parking sign is not sufficient enough to warn drivers with accessible parking permits driving a regular car not to park in the van accessible designated spaces. We also hypothesize

that the installation of a more discriminant designated van accessible sign might reduce the number of NRLEVs that park in the designated van accessible spaces.

General Method

To better understand and investigate the research questions, researchers integrated different research methods and approaches in this study. First, the researchers used mixed method approach with both qualitative and quantitative research methods. Specifically, we conducted a focus group made up of ramp or lift equipped van (RLEV) users to investigate the significance of van accessible parking spaces being taken by NRLEV users, and whether current signs for designated van accessible parking are salient enough to prompt non ramp or lift equipped vehicles (NRLEV) to park in other accessible spaces to allow RLEV vans to park in their designated van accessible spaces. We also conducted short interviews with the NRLEV drivers who parked at the designated van accessible spaces to better understand their views about the current signs for designated van accessible parking. Then we conducted a multi-component analysis, with an imbedded reversal single-subject experimental design to evaluate and compare the effects of the current van accessible sign to appropriately signal or prompt parking with other comparative signs designed for the study. To summarize, this study includes a qualitative study composing of a focus group discussion and brief interviews, and an experimental study.

To ensure and maximize the social validity of the research, we used a participatory action research (PAR) process by emphasizing the involvement of consumers' involvement in conducting the entire study (Seekins, & White, 2013). Besides conducting the initial focus group, we reported to and received feedback from a consumer empowerment team (White, Nary & Froehlich, 2001), which was composed of people with disabilities who used designated van accessible parking spaces.

Study 1 Qualitative Study: Focus Group and Interviews

The qualitative study composed of a focus group discussion of RLEV users and some brief interviews with NRLEV users who parked in the designated van accessible parking spaces. The first step of this study was to conduct a focus group to investigate the importance and relevance of the research questions about the issue of van accessible parking. The focus group was convened to provide anecdotal data to direct researchers on how to address this new research question further. The researchers gathered information about the severity, frequency of this problem and solicit any other experiences that members had about designated van accessible parking spaces being occupied by NRLVE. The researchers also conducted brief interviews with NRLEV users who parked in the designated van accessible parking spaces to get insight from NRLEV users' views regarding the research problem. Data from both RLEV and NRLEV users can be used to check and establish validity in the current study by analyzing a research question from multiple perspectives, which is defined as triangulation, a method often used in qualitative studies (Guion, Diehl, & McDonald, 2011).

Focus Group Method

Sample/Recruitment. The focus group included RLEV users who have an accessible parking permit. Members not only included people with disabilities who actually drive RLEV, but also those with disabilities who are unable to drive themselves, but use RLEVs as means of transportation. Drivers without disabilities who drive the NRLEV for people with disabilities, such as family members or personal care attendants were also invited.

Participants were invited through the use of a recruitment flyer distributed through Independence, Inc., a local center for independent living, and United Access, a company that sells/rents RLEV to their consumers. Interested participants were then asked to contact a member

of the research team to obtain more information about the study. Thirteen RLEV users with accessible parking permits agreed to participate in the focus group. Each participant was reimbursed with a $25 ClinCard as compensation for their time and effort following the focus group discussion.

Procedure. The focus group was convened in the conference room of Independence, Inc., which had ample parking for about ten RLEV and a meeting room for about ten wheelchair and/or power wheelchair users. A facilitator guided the discussion and a recorder took discussion notes and wrote them on tear sheets while a note taker took detailed meeting notes. The facilitator distributed the consent forms to the participants and read the consent form out loud at the start of the focus group. The facilitator also gave a full explanation of the purpose and ground rules regarding confidentiality to the participants. Participants were fully informed about their rights, especially in terms of freely declining or withdrawing during or after the focus group. Only those participants who signed the consent form would be part of the focus group. All group members consented to the discussion being taped, and it was explained that all collected data would be made anonymous. The focus group lasted about 1.5 hours.

Participants completed a demographic questionnaire before the focus group discussion and an evaluation survey following the focus group discussion. The demographic questionnaire, evaluation survey, detailed focus group scripts, and all other materials were developed by the researchers and approved by the University of Kansas IRB.

The researchers developed two versions of demographic questionnaires, one for people with disabilities and another for people without disabilities. The demographic questionnaire format included questions about age, disability type, years of disability, and years of driving with accessible parking permits. See Appendix 1.

The evaluation survey required focus group participants to rate their satisfaction with the focus group discussion. First, the participants rated their satisfaction with their experiences in the group on a Likert scale from 1 to 5 (strongly disagree to strongly agree), (e.g., the focus group topic and the extent to which they expressed themselves). Second, the participants rated their overall satisfaction with the focus group and the facilitator on a Likert scale from 1 to 4 (poor to great). Finally, two open-ended questions allowed the participants to make other comments about the focus group and the discussion. See Appendix 2 for the evaluation survey.

The facilitator used open-ended questions to ask focus group members about their experiences with van accessible parking, and the experience of the van designated space being occupied by drivers driving a regular car with accessible parking permits. See Appendix 3 for focus group script details.

Coding. Transcripts were gleaned from focus group audio recordings for further review and analysis. The researchers coded the transcript using structural coding method, which "is appropriate for virtually all qualitative studies, but particularly for those involving multiple participants, standardized or semi-structured data-gathering protocols, hypothesis testing, or exploratory investigations to gather topic lists or indexes of major categories or themes" (Saldaña, 2012, p. 84). After thoroughly reading through the transcript, the researcher summarized and coded the transcribed data into 4 major categories and 14 sub-categories. Then the researcher incorporated feedback from a senior researcher experienced in qualitative study after peer debriefing. Because of the small amount of the qualitative data, we did not use computer assistive qualitative software for this project. This process is described next.

Peer debriefing. The researchers used peer debriefing, which is a process to enhance the credibility or validity of qualitative research (Creswell, 1998). During debriefing researchers

meet with one or more other impartial colleagues in order to critically review the implementation and evolution of their research methods (Spillett, 2003). Specifically, the peer debriefer discusses the researcher's consideration of methodological activities and provides feedback concerning the accuracy and completeness of the researcher's data collection and data analysis procedures (Spillett, 2003). For the current study, after one researcher coded the data and created the coding scheme, another senior researcher highly experienced in qualitative method and disability study reviewed the transcript and the coding scheme, and determined whether initial categories adhered to the data, and if data summaries accurately reflected the informant's perspective.

Focus Group Results

Demographic information. There were 13 participants in the focus group. However, one participant was a paratransit service provider, whose experience was different from other focus group members. The researchers excluded this participant's data for analysis to ensure the homogeneity of the focus group data. Six participants were males and six were females. Ten were people with disabilities and two were people without disabilities, who were caretakers and drove for people with disabilities. The participants ranged from 31 to 69 years of age.

For the 10 participants with disabilities, six were paraplegic, while others had different physical disabilities. Most participants had severe mobility impairments and needed to use RLEV as a means of transportation. The duration of the participants' disabilities ranged from 3.5 to 49 years, with an average of 23.75 years. The years of driving with an accessible parking permit ranged from 2 to 45 years, with an average of 20 years. The years of driving with a NRLEV ranged from 0 to 37 years, with an average of 9.9 years. The years of driving with a RLEV ranged from 1 to 24 years, with an average of 7.1 years. Three participants needed

personal care attendants to access the van and 8 participants reported that they could get in and out of a van by themselves. The number of trips taken per day ranged from 0 to 8. See Table 1.

For two people without disabilities, who were drivers or personal care attendants for people with disabilities using ramp or lift equipped vans, the age ranged from 35 to 69 years old. The years of driving with an accessible parking permit ranged from 7 to 25 years, with an average of 16 years. The number of trips taken per day was 3. See Table 2 for detailed demographic information.

Focus group analysis. The researcher initially created 4 major categories and 14 subcategories and submitted them to a senior researcher for peer debriefing. The peer debriefer confirmed the majority of the coding, only suggesting changing the first major category from "usefulness of current accessible parking spaces" to "barriers to finding van accessible parking spaces". The researcher finalized the coding and presented the coding in a table with the sample quotes. See Table 3 which identifies 4 major categories and 14 subcategories, along with exemplary focus group quotes that correspond with these categories and subcategories.

The first major category addresses barriers to finding available designated van accessible parking spaces. All participants stated it was important to have designated van accessible parking spaces because they provide larger area and access aisles, which provides more room for the ramps or lifts to come down, and the wheelchair to exit past the ramp. While designated van accessible parking spaces are important to RLEV users, several barriers exist, which impairs the usefulness of these spaces and, therefore, the participants' parking experience. Most participants stated that the designated van accessible parking spaces were often taken by NRLEV, causing RLEV users difficulty in finding parking. Some participants had to drive around to look for

suitable parking spaces, or had to park far away from the business entrance. Another barrier was that the spaces for RLEV are rare, especially in small communities.

Since many barriers cause difficulty for RLEV users parking in van accessible parking spaces, they have developed their own strategies to find parking spaces. One approach is to park at the far end of the parking lot where fewer spaces are occupied. Another strategy is to drop off the person with a disability just in front of the entrance when there is a non-disabled driver. Another focus group member said he would consider having a van with a lift coming out at the back so that he did not have to worry about whether there was enough space for a side mounted lift or ramp. Some stated that they would occupy two regular parking spaces to allow room to get out with the ramp and wheelchair.

The focus group members also discussed why RLEV users had problem finding designated van accessible parking spaces, or put it another way, why NRLEV users keep taking the designated van accessible parking spaces. To summarize, there are both environmental factors and personal factors that contribute to this socially significant problem. Regarding environmental factors, focus group members mentioned two concerns. First, current van accessible parking signs are not effective in providing direction for drivers with accessible parking permits. Second, the designated van accessible parking space is usually closer to the entrance compared with the regular accessible parking space. Besides the environmental factors, there are important personal factors that contribute to the van accessible parking spaces being taken by NRLEV, which were identified by the group as ignorance or lack of understanding of the function of designated van accessible parking spaces. All these factors caused NRLEV users to take whatever accessible space that is available, and more likely to take designated van accessible parking spaces.

The focus group members also discussed and suggested the solutions to help address this problem. One suggestion was to modify the van accessible parking sign. Specifically, the group suggested that the current wording of the sign should be changed from "van accessible" to "van only". Another suggestion was to use separate permits or placards for RLEV. The third suggestion was to make all the accessible parking spaces universal, with large hash mark areas or access aisles (e.g., 11 feet wide parking space with 5 feet access aisle), thus any vehicle could use either space without any access problems. The fourth suggestion was to put the van accessible space further from the entrance than the regular accessible space in the parking lot, (e.g., regular accessible parking spaces the closest to the entrance and designated van accessible parking spaces the next closest spaces (on the other side of the diagonally striped access aisle). The fifth suggestion was to conduct campaigns to help educate the public, especially the disability community, to better understand the function of designated van accessible parking spaces. One focus group member suggested that the education concerning the accessible parking spaces should be included on the driver's test.

Evaluation of the focus group. In general, all the participants gave very positive evaluations for the focus group. Specifically, the participants thought that the focus group topics were interesting (M = 4.85) and the questions were easy to understand (M = 4.35). They felt that they fully expressed their opinions (M = 4.92) and were listened to during the discussion (M = 5). In fact, the focus group topic, the van accessible parking, was of great interest to all the participants and they greatly contributed to the discussion. According to the open-ended questions, the participants thought the focus group had a thorough discussion of this topic and the majority commented that they expected the study could make a change to the designated van accessible parking issue. See Table 4.

Interview Study Method

Participants. Participants of this brief interview were people who parked in the designated van accessible parking space with official tags or license plates, but without a RLEV. Ten people were interviewed, 7 of them were female and 3 were male.

Settings. We conducted the interviews at a site containing a parking lot with high parking turnover. It was located in a well-developed commercial district in a Midwestern community, serving a mixture of local families and college students. After pilot research of various parking lots, we identified one grocery store parking lot which was similar to the parking lots we chose for observation and intervention in study 2. The grocery store parking lot met the selection criteria of having high parking turnover, and accessible parking spaces' configuration similar to Study 2 research sites.

Procedure. The interviewer was unobtrusively located inside the front door of the store, which allowed good vision of the accessible parking spaces. Only those who parked in designated van accessible parking space, but did not have an accessible van (i.e., either had an accessible driving hang tag or license) were interviewed after they parked their vehicles and entered the store. The interviewer politely approached the identified participant and asked the participant's oral consent to participate in a quick 2-3 minute interview. If the participant refused the request, the interviewer thanked the person for his or her time and waited for another participant who met the interview selection criteria. The questions were centered on whether the drivers could distinguish the regular accessible parking signs from the van accessible parking signs. Sample questions included: "What does the "van accessible" sign mean to you in terms of parking?", "Who do you think should use the "van accessible" sign?" etc. See Appendix 4 for the complete survey.

Interview Study Results

The first two questions were general questions about more general accessible parking, and were designed to segue the participants to more specific questions about the van accessible parking. The first question was about whether the participants thought there were enough accessible parking spaces at the store. Nine out of ten participants said yes, or yes, most of the time, only 1 person said no. The second question asked whether the accessible parking spaces were enforced so those with license or accessible parking tags could park in them. The majority of the participants (9 persons) responded positively that they could find an accessible parking space to park, though sometimes the carts would be in the way. However, one participant indicated that sometimes people without accessible parking permits would park there, and police did not enforce local accessible parking ordinances.

Beginning with the third question, the questions were planned to explore the participants' views about van accessible parking spaces. The researchers took pictures of both the designated van accessible parking space and the regular ADA parking space signs that were observed, and showed them to the participants. The participants then were requested to indicate which picture represented the parking sign of the space in which they just parked. Of the 10 participants who parked in the designated van accessible parking space without RLEVs, 6 indicated that they parked in the regular ADA parking with sign space, while 4 indicated that they parked in the designated van accessible parking sign space.

When asked the fourth question, what the "van accessible" sign means to the participants in terms of parking, the participants had different opinions. To summarize, two participants thought the van accessible sign meant larger spaces. Most of the participants mentioned that the space was for wheelchair users who use vans or large vehicles. One participant indicated that the

space was for people with disabilities with vans, but she would take it when it's available because it's closest to the door of the store.

When asked who should use the "van accessible" sign (the fifth question), the participants responded differently. Only two people specifically mentioned only ramp or lift equipped vehicles should park there, while two other participants said these spaces should be for people with accessible parking permits or tags. Three participants indicated that they should be van and/or truck users, without specifying ramp or lift equipped feature. Two participants said these spaces should be for people in need. One participant did not know the answer to this question.

Based on the responses from the participants, when talking about the term "van", it is not clear whether the participants specifically indicated van in general or van with ramp or lift. To clarify this question, we added a question: Do you think the "van" should be ramp or lift equipped to park in the "van accessible" space?" Seven participants answered this question, with four participants stating that it was unnecessary that the van should be ramp or lift equipped to park in the van accessible space. Three participants said yes, but one participant added that she would park there if no other spaces were available.

Study 1 Conclusions

The results of focus group and the brief interviews demonstrated that the current research problem was of social importance to RLEV users, and the current sign for van accessible parking was not effective in directing NRLEV users not to park in the van accessible spaces. In addition, the findings indicated that modifying the current signage might be an effective intervention strategy. In all, these studies combined to help provide detailed information to inform social validation in terms of the goals and procedures for the intervention study.

Study 2 Experimental Study: Multiple Baseline across Two Sites to Assess the Effects of Different Signs

Method

Participants. The participants for this study were anyone who parked in one of the two observed accessible parking spaces at observation sites A and B. One of the spaces was designated as "van accessible", while the other was a regular accessible parking space. The participants parked in these two spaces with various vehicles such as cars, trucks, SUVs, vans, and RLEV.

Most participants occupying the spaces had state-issued mirror tags or license plates allowing them to legally park in these spaces. However, there were still some drivers parking illegally without any officially issued parking permits.

Settings. For observation sites, the researchers conducted this study in parking lots that had high parking turnover. The locations were in well-developed commercial districts in a Midwestern community, serving a mixture of local families and college students. After conducting initial site evaluations of various parking lots, researchers identified two grocery store parking lots as appropriate observation sites. The two grocery store parking lots met the selection criteria of having relatively high parking turnover within a one-hour period, and having a consistent accessible parking spaces configuration complying with ADAAG.

Each store had a two-way traffic lane, which went in front of the store. Cars using the appropriate lane could turn and access parking spaces. The accessible parking spaces were located on the other side of the bi-directional traffic lanes, in front of the main entrance. Eight accessible parking spaces were available at Site A, with two of them designated for vans. Eleven accessible parking spaces were available at Site B, with four of them designated for vans. All the

spaces were marked with an international access symbol (wheelchair) painted on the ground and with signs mounted on steel poles perpendicular to the ground. The sign for standard accessible parking spaces was the access symbol with the word “accessible parking” or “disabled parking”. The sign that designated the van space was the standard accessible space sign plus the words “van accessible” below this sign. A *designated van accessible parking space* and a *regular accessible parking space* adjacent to the van space were selected as the observation sites for each store. For both of the parking spaces, the designated van accessible parking spaces were closer to the entrance of each store. See Figure 1 for pictures of the two observational settings.

Researchers first contacted the ADA coordinator of the targeted research community to solicit a letter of support. Researchers then contacted the two grocery store managers to explain the study purpose and showed the ADA coordinator’s support letter. They received managers’ permission to observe and make temporary changes of accessible parking signs as necessary, depending upon the experimental conditions.

Observation and measurement. Four undergraduate students from a university applied behavioral science class were trained as observers, and the researchers also served as observers. The students received course credit for their observations and could use part of the data for their class project. All the observers received off site and onsite training about the operational definitions, scoring form and the use of the interval timer with supervised practice and feedback. The researchers observed with undergraduate students until they reached 100% inter-observer reliability for at least two sessions with the researcher. Student observers observed without the researchers for 17.9% of the entire sessions. Inter-observer reliability was obtained during the entire experimental study for over 33% of the sessions in each condition. The observers were instructed to do their observations independently and not to confer with each other. Inter-

observer agreement was determined by calculating the percentage of times two observers agree on a particular response category (agreements divided by agreements plus disagreements times 100).

All the observations were conducted from April to July of 2014, Monday through Sunday between 11:00 a.m. and 1:30 p.m., and between 4:00 and 6:30 p.m. However, most observations were made during the designated times of Monday through Friday. Each observation interval lasted for an hour, and the peak shopping hours of two consecutive sessions could be conducted with a half hour break in between them to allow vehicles to leave and "reset" the parking spaces. The observers were instructed to sit in a parked vehicle that allowed a clear view of the to-be-observed areas several parking spaces away. Alternatively, the observers were in an unobtrusive location near the front of the store about 15-20 meters from the observed spot. Observers were allowed to go to the target spaces only when necessary to determine if a vehicle had an accessible parking tag or license plate, and then only after the driver had entered the store.

To accurately observe the accessible parking, especially the RLEV parking, researchers used the instantaneous recording method (Cooper, Heron, & Heward, 1987). To make sure that the observers record the target behavior accurately at each 1-minute time interval, the researchers used GYMBOSS miniMAX interval timers, which were programmed to beep or vibrate when each 1-minute interval expired.

Trained observers recorded the occurrence of the target parking behaviors in the designated van accessible parking space and the adjacent regular accessible parking space using a scoring form, based on operational definitions developed by the researchers. For the designated van accessible parking space, the form contained codes, including non van (NV), representing any time a designated van accessible space was occupied by a non-ramp/lift vehicle and van (V),

which identified any time a designated van accessible space was occupied by a ramp/lift van. In addition, the observers kept a record of any instances that NRLEV withdrew from the designated van accessible parking spaces and parked elsewhere on the scoring form. For the regular accessible parking space, the target behavior code was occupied (O), indicating the regular accessible space was occupied. For both of the spaces, there are codes such as available (--), representing the accessible parking space was available or empty and illegal parking (I), representing any time a designated van accessible or regular space was occupied by a vehicle without a displayed permit/license. We also recorded whether the vehicles parked over the diagonal lines and intruding the access aisle with the code D. See Appendix 5 for the scoring form.

Dependent variables. The main dependent variables include the percentage of deterrence of NRLEV and the occurrence of NRLEV in designated van accessible spaces. The percentage of deterrence of NRLEV was defined as the number of NRLEV drivers who intended to park in the designated van accessible space but withdrew and parked elsewhere when they saw the intervention signs, divided by the total number of vehicles that parked or intended to park in the observed designated van accessible space per each session. The occurrence of NRLEV was defined as the occurrence of NRLEV parked in the observed designated van accessible space during any portion of a 60-minute session.

Experimental conditions. Researchers conducted direct observation assessments of control (current van accessible parking sign, sign A, see Figure 2) versus experimental designated van accessible parking signs on the parking behavior of drivers who do not use RLEVs, yet park in van accessible space designated for RLEV. As an exploration study, researchers first planned to conduct this study with a multiple baseline across two settings using

ABAB design, with the hypothesis that the first intervention sign would work effectively. However, as the study progressed, the researchers observed that the first intervention sign was not sufficient for designed change, and the study was refined according to these data.

Specifically, the researchers designed three additional intervention signs after implementing the first intervention sign. The design of the four intervention signs were based on the input from the focus group members, an independent living specialist and a local city ADA coordinator. We systematically implemented the intervention signs to determine the most robust intervention effect in terms of preventing NRLEV parking in the designated van accessible parking spaces. Sign B pictorially displayed van accessible parking plus the words “ramp or lift equipped”. It was 10 inches (25.4 cm) wide and 12 inches (30.48 cm) long. Sign C was a sign that pictorially displayed van accessible parking plus the words “ramp or lift equipped van” and “please be courteous”. Sign D was a sign that pictorially displayed van accessible parking plus the words “ramp or lift equipped van” and “priority”. Sign E was a sign that pictorially displayed van accessible parking plus words “ramp or lift equipped van” and “Warning”. Sign C, D, and E were all in the same size, which was 12 inches (30.48 cm) wide and 18 inches (45.72 cm) long. See Figure 3 for the intervention signs.

The entire experimental study consisted of a multi-component analysis with an embedded reversal design. The researchers conducted a multiple baseline across two settings design to compare the effects of the intervention signs. Then the researchers conducted a reversal design to test and validate the most effective intervention effects identified by the multi-component analysis.

During the multi-component analysis, observers independently scored use of the designated van accessible parking spaces ("van accessible" sign, sign A) and the regular

accessible parking spaces by drivers with RLEV and NRLEV across both sites under baseline condition. Following baseline, researchers replaced the standard designated van accessible parking signs with Sign B. Depending on the stability and effectiveness of the data, the researchers then decided whether and when to conduct further intervention conditions with C, D, or E.

After identifying the most effective signs, the researchers used a reversal design to further examine and validate the effects of the identified intervention signs for each site. To accomplish this, the researchers replaced the intervention signs with the original standard designated van accessible parking signs to collect baseline data. Observations were conducted following the same procedure as the previous phases. After the second baseline, the researchers installed the most effective signs for each site, intervention sign C for store A and intervention sign E for store B. The researchers then changed back to a third baseline, reinstalling the original sign. This was followed by a final reversal to the most effective sign intervention at each site.

During follow up, observations were conducted five weeks later at store A and four weeks later at store B to check for durability of the intervention effects over time. Due to parking lot construction at store A, the follow up period was about a week longer at store A than at store B.

Results

Figure 4 illustrates the percentage of the deterrence of NRLEV among all the vehicles intending to park in the designated van accessible parking spaces of a session. For store A, the percentage of the non-ramp or lift equipped vehicles being deterred among all the vehicles parking in the designated van accessible parking spaces during the baseline was 0 (sessions 1 to 5), indicating that the standard designated van accessible sign had no effect. After baseline, the

intervention signs were installed to test their effectiveness in deterring NRLEV parking in the designated van accessible spaces. For the ramp or lift sign (sessions 6 to 21), the percentage increased to 6.88%. For the courtesy sign (sessions 22 to 30), the percentage increased to 18.5%. When the priority sign (sessions 31 to 40) was installed, the percentage decreased to 10%. Under the warning sign condition (sessions 41 to 49), the percentage further decreased to 4%. For store A, the courtesy sign worked most effectively. To experimentally test the effect of the courtesy sign and control of the effects of other signs, we again installed the standard designated van accessible sign, and returned to baseline condition. Similar to baseline one, the second baseline (sessions 50 to 54) percentage was 0. After the second baseline, the courtesy sign (sessions 55 to 62) was again installed. The percentage increased to 30%. A reversal was made to the third baseline condition (sessions 63 to 69), with the percentage of deterring NRLEV returning to zero. Following the third baseline condition, the courtesy sign (sessions 70 to 77) was reinstalled with the percentage increasing to 21.88%. After five weeks' follow up (sessions 78 to 80), the effect declined to 11%.

For store B, the percentage of the deterrence of NRLEV among all the vehicles parking in the designated van accessible parking spaces of a session during the baseline (sessions 1 to 18) was 0, indicating that the standard van accessible sign had no effect. After baseline, the intervention signs were installed to test their effectiveness in deterring NRLEV parking in the designated van accessible spaces. Different from store A, the ramp/lift sign (sessions 19 to 26) and the courtesy sign (sessions 27 to 35) had no effect at store B. The percentage stayed at 0 for both of the two conditions. In contrast, the priority sign (sessions 36 to 44) showed a 19 percent increase. Switching to the warning sign condition (sessions 45 to 52), the percentage further increased to 35%. For store B, the warning sign worked most effectively. To experimentally test

the effect of the warning sign and control of the effects of other signs, the standard designated van accessible sign was installed again to return to baseline condition (sessions 53 to 57). Similar to baseline one, the percentage in the second baseline was still 0. Following the second baseline, the warning sign was reinstalled (sessions 58 to 65), and the percentage rose to 25%. The third baseline condition (sessions 66 to 71) was then applied, and the percentage again decreased to 0. Following implementation of the third baseline condition, the warning sign (sessions 72 to 77) was reinstalled with the percentage increasing to 33%. The effect declined to 15% after a month's follow up (sessions 78 to 82).

Figure 5 illustrates the occurrence of the NRLEV of a session. It is another way to show the effects of the intervention besides the percentage of NRLEV deterrence. The procedures were the same as described above for Figure 4. For store A, the average occurrences of NRLEV parking in the designated van accessible parking space in an hour session during the baseline (sessions 1 to 5) was 46. After baseline, the intervention signs were installed to test their effectiveness in deterring NRLEV parking in the designated van accessible spaces. For the ramp or lift sign (sessions 6 to 21), the average occurrence decreased to 37.44. For the courtesy sign (sessions 22 to 30), the average occurrence slightly increased to 39.67. For the priority sign (sessions 31 to 40), the average occurrence increased to 41.5. For the warning sign (sessions 41 to 49), the average occurrence increased to 42.33. According to data about the percentage of the NRLEV being deterred among all the vehicles intending to park in the van designated accessible parking spaces of a session, we identified that in store A, the courtesy sign had the best intervention effect. In the second baseline condition (sessions 50 to 54), the average occurrence was 44.4, and decreased to 42.38 during the courtesy sign condition (sessions 55 to 62). A reversal was made to the third baseline (sessions 63 to 69), and the average occurrence increased

to 47. Following the baseline, the courtesy sign was reinstalled (sessions 70 to 77). The average occurrence was 44. For the follow up condition (sessions 78 to 80) after five weeks, the average occurrence decreased to 43.

For store B, the average occurrences of NRLEV parking in the designated van accessible parking space in an hour session during the baseline (sessions 1 to 18) was 29.06. After baseline, the intervention signs were installed to test their effectiveness in deterring non-ramp or lift equipped vehicles parking in the van designated spaces. For the ramp or lift sign (session 19 to 26), the average occurrence was almost the same as it was in baseline, which was 29.05. For the courtesy sign (sessions 27 to 35), the average occurrence increased to 32.44. When the priority sign (sessions 36 to 44) was installed, the average occurrence decreased to 22.67. Under the warning sign condition (sessions 45 to 52), the average occurrence further decreased to 21.88. According to data about the percentage of the non-ramp or lift equipped vehicles being deterred among all the vehicles intending to park in the designated van accessible parking spaces of a session, researchers identified that the warning sign had the best intervention effect in store B. The standard van accessible parking sign was installed as the second baseline condition (sessions 53 to 57), and the average occurrence increased to 38. Following the second baseline, the warning sign (sessions 58 to 65) was again installed. The average occurrence declined to 22. A reversal to third baseline (sessions 66 to 71) was made, and the average occurrence increased to 28.83. Following the third baseline condition, the warning sign (sessions 72 to 77) was installed, and the average occurrence decreased to 21.5. For the follow up condition (sessions 78 to 82) after a month, the average occurrence declined to 15.

Secondary Data. Besides the main variables, the researchers also collected some secondary data, such as the occurrences of RLEV parking in the designated van accessible

spaces (V) and the occurrences of vehicles parking over the diagonal lines and intruding the access aisle (D). At store A, no RLEV parked in the observed designated van accessible parking space during the observation periods. At store B, 4 RLEVs parked in the designated van accessible parking space during 4 observation sessions.

Among the 80 observation sessions at store A, the occurrences of vehicles parking over the diagonal lines and intruding the access aisle occurred during 26 sessions (32.5%). During the 26 sessions, intrusions of the diagonal lines caused by the vehicles parked in the designated van accessible space occurred during 13 sessions and intrusions caused by the vehicles parked in the regular accessible parking space occurred during 15 sessions. For the vehicles parked in the designated van accessible space, when intrusion occurred, the average percentage of vehicles parked over the diagonal lines was 45.4%. For the vehicles parked in the regular accessible space, when intrusion occurred, the average percentage of vehicles parked over the diagonal lines was 53.9%.

Among the 82 observation sessions at store B, the occurrences of vehicles parking over the diagonal lines and intruding the access aisle occurred during 30 sessions (36.6%). During the 30 sessions, intrusions of the diagonal lines caused by the vehicles parked in the designated van accessible space occurred during 15 sessions and intrusions caused by the vehicles parked in the regular accessible parking space occurred during 19 sessions. For the vehicles parked in the designated van accessible space, when intrusion occurred, the average percentage of vehicles parked over the diagonal lines was 71.1%. For the vehicles parked in the regular accessible space, when intrusion occurred, the average percentage of vehicles parked over the diagonal lines was 79.0%.

Inter-observer Reliability. Measures of inter-observer reliability were obtained for 39

of the 80 (48.8%) observation sessions for store A. For each condition, we collected inter-observer reliability data among at least 33% of the observation sessions. For Store B, measures of inter-observer reliability were obtained for 36 of the 82 (42.9%) observation sessions. For each condition, we also obtained inter-observer reliability among at least 33% of the observation sessions. Inter-observer agreement was determined by examining the data taken independently by two different observers across each of the chosen observation periods. Agreement was formed by calculating the percentage of times two observers agreed on a particular response category (agreements divided by agreements plus disagreements times 100). For store A, the overall average inter-observer reliability was 99.4%, and ranged from 87.5% to 100%. For store B, the overall average inter-observer reliability was 99.9%, and the range was from 98.9% to 100%.

Discussion

In this explorative study, the researchers sought to empirically understand the parking problem RLEV users encountered because of the reduced availability of designated van accessible parking spaces caused by NRLEV users taking the space, and to test whether a signage intervention would increase the availability of the designated van accessible parking spaces by prompting NRLEV users to not use the space. This study combined both qualitative and quantitative approaches to conduct an in-depth investigation of the research question. The study demonstrated that the parking problem RLEV users encountered was common to RLEV users and the problem posed potential risk to the safety and the independence of RLEV users. The study also revealed that the sign intervention could moderately increase the availability of the designated van accessible parking spaces.

The qualitative study provided deeper truth of the research problem or phenomenon by interpreting it in terms of the meanings people bring to it, and by using a holistic perspective which serves the complexity of human's behavior (Greenhalgh, & Taylor, 1997). It also helped obtain the social validity of the study in terms of the research goal and the procedures. The focus group discussion provided very rich information concerning the research question. Participants shared their personal experiences about parking with a ramp or lift equipped van and associated feelings and emotions, such as anger, frustration, etc. The focus group study results confirmed the researchers' hypothesis about the significance of the research focus and questions. The designated van accessible parking spaces being taken by NRLEV with accessible parking permits was an important concern for RLEV users. Specifically, RLEV users reported encountering it very often, and it reduced their opportunities to find the appropriate parking spaces, which could cause emotional frustration, waste of time, and even safety concerns for

people with physical disabilities. The discussion also showed strategies that the focus group members developed to cope with this problem in their daily living. While these strategies might help them find parking spaces, they might encounter greater risk (e.g., parking at the far end of the parking lot with potential risk of being hit by the traffic trying to wheel to or from a store). As this was a new question that hasn't been studied before, research literature was not readily available, besides anecdotal reports from NRLV users. In this case, the focus group data was especially important in validating the significance of the research questions and providing input to expand the study. This qualitative study used the PAR approach, where researchers adopted the consumers or stakeholders' voice and perspectives regarding research goals, methods, outcomes and knowledge transition (Seekins, & White, 2013).

The focus group discussion also stimulated ideas to address this problem. Specifically, the participants proposed ways that included modification of the van accessible parking sign, a possible education campaign, making the van accessible parking spaces and regular accessible parking spaces universal to accommodate both RLEV and NRLEV users, etc. The idea of modifying the designated van accessible parking sign was aligned with the researchers' hypothesis about the current designated van accessible parking signage's insufficiency as a stimulus to direct NRLEV drivers with accessible parking permits to regular accessible parking spaces.

In all, the focus group study was very informative and useful. However, there were some limitations. First, the number of the focus group members was somewhat larger than the recommended number, eight to ten. The group size might have limited the chance and time that each participant had to fully speak their mind. The researchers over-recruited and did not expect that all participants would attend the meeting. Since nearly all participants attended the focus

group, this might also suggest that the topic was of great concern to them. For example, one participant traveled over 85 miles to attend this meeting. The focus group participants comprised a very representative sample, including both people with disabilities and personal care attendants, gender and geography (e.g., rural and urban communities).

In addition to the focus group, the brief interviews examined NRLEV users' view of parking in the designated van accessible parking spaces, which could provide information regarding why NRLEV users might park in these spaces. There were some interesting findings. First, when the interviewer showed the participants pictures of both the designated van accessible parking sign and the regular accessible parking sign, from where the participants just parked, most participants stated that they parked in the space with the regular accessible space signage, while in fact they each had parked in the designated van accessible parking space. The survey suggested some explanations about why most of the participants did not choose the correct signage. One explanation could be that some did not notice the sign in the parking space or the differences between the signs. In fact, some participants looked back at their parking space to find the sign marking that parking space. Another explanation might be that some participants saw the sign in the space they just parked, but did not want to admit that they used the designated van accessible parking space as they did not have a ramp or lift equipped van or even a regular van.

While most participants did not indicate the pertinent sign in the space where they just parked, all recognized some difference between the regular accessible parking space and the designated van accessible parking. Specifically, they stated that the designated van accessible space was larger and was designed for wheelchair users or large vehicles. Also most participants thought people with accessible parking permits or tags could park in the designated van

accessible parking spaces, which was consistent with the current state statutes and city ordinances. Any person with an accessible parking permit is allowed to use the designated van accessible parking space.

At this point, it was necessary to clarify the definition of the word "van". A van could be a standard van without being ramp or lift equipped. This type of van could be a larger vehicle compared to other cars, but it did not necessarily need to be parked in the designated van accessible space, if it did not have a ramp or lift to assist people with disabilities getting in and out of the vehicle. When asked whether the participants thought the van should be ramp or lift equipped to park in the "van accessible" space, four out of seven (57%) participants thought it was unnecessary, and three participants thought it was necessary.

Both of the focus group and the interviews provided important information to further explore this research problem. Also, the two data sources, both from RLEV users and NRLEV users, validated the findings for each other. First of all, the fact that NRLEV users tended to take the designated van accessible parking spaces confirmed the barrier that RLEV users had in terms of finding designated van accessible parking spaces. Second, the fact that a larger portion of NRLEV (6/10) users stated that they could not recognize and differentiate the designated van accessible parking sign and the regular accessible parking sign may validate the ineffectiveness of the current van accessible parking signs and the lack of understanding as the reasons causing NRLEV users to take designated van accessible parking spaces. Third, some of the NRLEV users recognized that the designated van accessible parking spaces are for wheelchair users, and larger vehicles or vans, but did not recognize the need of ramp or lift equipped vehicles, which suggested that NRLEV users lacked understanding about the use of the designated van accessible parking space, reaffirming one of the focus group members' points. Finally, some of the NRLEV

users indicated that they took the designated van accessible parking space because the space was available and closer to the entrance of the store, which also confirmed the focus group discussion.

This experimental study was explorative in design. Previous research has addressed illegal use of accessible parking spaces by drivers without legal accessible parking permits or license plates. Several studies intervened using different modifications of the accessible parking signs and/or parking space, which was effective in terms of providing more salient stimulus to drivers and reducing the violation rate (e.g., Jason & Jung, 1984; White et al., 1988). For example, vertical signs plus ground markings were more effective than ground markings alone to deter violators (Jason & Jung, 1984) and warning signs were more effective than standard signs in deterring violators (White et al., 1988). These research findings then impacted the related policies regarding accessible parking and were well applied in the accessible parking spaces configuration. In the current study, the researchers adopted the similar strategy of using different signage to provide a more salient prompt for drivers with accessible parking permits driving NRLEV. The focus group validated one important hypothesis, especially those who had experience of initially driving a NRLEV and later switching to a RLEV as their disability or age progressed. The hypothesis was that the function of the current designated van accessible parking space sign does not clearly convey the purpose of the parking space. Or put it into another way, the information of the current designated van accessible parking sign could not answer the following questions. Why is there a need for the van accessible parking spaces? What kind of vehicles are eligible for parking in the van accessible parking spaces? If the sign does not contain information to clearly answer these questions, then there is a greater probability

that NRLEV drivers will take the designated van accessible parking space based on limited information or prompt.

To test whether a more meaningful signage would make a difference in prompting drivers to use the most appropriate parking spaces for them, the researchers designed several signs that addressed the two essential questions raised above. Specifically, we designed a pictorial sign of a ramp equipped van with a ramp coming out. We also adopted focus group participants' suggestion of adding a wheelchair symbol at the end of the ramp to show that people with disabilities, especially wheelchair users needed the ramp to descend out of the van and into the access aisle. To make the point even clearer, we put the words "ramp or lift equipped" and later "ramp or lift equipped van" under the pictorial van sign to clearly identify what kind of vehicles or vans were eligible for parking in the designated van accessible parking spaces. This was the first intervention sign designed for the study. However, the intervention effects were not as positive as we hypothesized. We designed three additional signs after consulting with colleagues, drivers with accessible parking permits, independent living experts and law experts, and also examining study data regarding deterring violation of accessible parking space. As indicated by the previous study about deterring violation of accessible parking space, the content of the message on the parking sign played an important role in creating the intervention effects (Cope, Lanier, & Allred, 1995). We added messages on the top of the three new intervention signs to convey different levels of stimulus demands ranging from "please be courteous", "priority" to "warning". We also made the words on the bottom of the sign more explicit with "ramp or lift equipped van". To accommodate the modifications, the newly designed signs were larger than the first intervention sign. To summarize, the design of the intervention signs was explorative, but it also took consideration of the related study findings as an evidence base.

Besides the change made to the intervention signs, the main dependent variable also changed. At first, the main dependent variable was the occurrence of the NRLEV parking in the van accessible designated spaces during a session (one hour). We hypothesized that if the intervention signs were effective, then the occurrences of the NRLEV parking in the van accessible designated spaces during a session under intervention conditions would decrease significantly compared with the baseline conditions. However, as the study progressed, the data of this dependent variable did not display a high magnitude of effect. There were many variables affecting the occurrences of NRLEV parking in the designated van accessible spaces besides the parking signs, such as how long NRLEV users needed to spend in the store. For example, some NRLEV users parked in the van accessible parking spaces for an entire session or longer, suggesting this was not the best indicator of intervention effects. After careful analysis, another dependent variable, the percentage of NRLEV being deterred by the intervention signs was identified as a more sensitive indicator of intervention effects. This dependent variable influenced when to change experimental conditions.

The final change was the experimental design. The study was designed as a multiple baseline across two settings with a reversal design. However, because of the other three intervention signs (courteous, priority and warning) were added following the first intervention sign, a more robust evaluation was needed to test which intervention sign was most effective. The study then was revised into a multi-component analysis with an imbedded reversal design. The researchers assessed which sign was most effective by comparing intervention effects of the intervention signs with the baseline and among different intervention conditions. The researchers then used a reversal design to validate the intervention effects of the signs selected from the multi-component analysis.

Small to moderate intervention effects emerged with NRLEV drivers being deterred by the intervention signs, after the above changes. Interestingly, the differential effects of the signs were not consistent across stores A and B. For store A, at phase 1, all of the four interventions signs had differential effects in deterring NRLEV drivers from parking in the designated van accessible parking space, with the courteous sign being most effective. For store B, at phase 1, only priority and warning signs showed intervention effects, with the warning sign being most effective.

Differential responses to signs across the two sites might be due to different factors such as customer population composition and the economic and geographic settings of the two stores. As part of the selection criteria, researchers chose store parking lots with similar characteristics, however there were some differences. For instance, the locally owned store A had prices that were less expensive than the national chain store B, which attracted more customers to shop and park in their parking lot, providing more opportunities for NRLEV users to respond to the intervention stimulus. In addition, it is possible that with more people entering and exiting the store, there might be increased social pressure of NRLEV users' parking in non-van designated accessible spaces. People generally try to cooperate with social norms, especially when norm compliance is monitored and publicly disclosed (Panagopoulos, 2010). Based on anecdotal evidence, there was less customer pedestrian traffic near the observed accessible parking spaces at store B than there was at store A. It is plausible that NRLEV users were under less social pressure to follow the accessible van posted parking signs.

Different signs with the greatest effectiveness at stores A and B were installed at corresponding observation spots, and a reversal design with a follow up was conducted. The

courtesy sign at store A and the warning sign at store B both demonstrated moderate maintenance during follow-up.

All the results and discussions above were mainly based on the dependent variable, percentage of NRLEV being deterred. However, we also collected data about occurrences of NRLEV parking in the designated van accessible parking spaces to provide supplemental support of the intervention effects. The data across different conditions suggests little significant reduction of NRLEV parking in the observed designated van accessible parking spaces at store A and moderate effect at store B.

Several factors might account for the small to moderate intervention effects of the current study in general. First, this is a relative new concern for the disability community. Many drivers with accessible parking permits do not know the difference between designated van accessible parking spaces and the regular accessible parking spaces, or the purpose of the designated van accessible parking spaces. Second, in contrast to illegal parking or violation of accessible parking ordinances, there are no consequences for drivers of NRLEV in occupying the designated van accessible parking spaces. Negative consequences or even punishment is an important factor shaping human behavior. Information containing legal consequences of some behaviors were found to effectively inhibit people's behavior, such as littering, stealing, etc. (Grasmick & Green, 1980; Reiter & Samuel, 1980). While legal or social consequences such as fine also played an important role in reducing the violation of accessible parking since it was required by the Americans with Disabilities Act (Cope, Lanier, & Allred, 1995). The ADAAG or many state parking statutes do not specify that designated van accessible parking spaces are only for ramp or lift equipped vehicles, and there has been no history of consequences for non-ramp or lift equipped vehicles parking in designated van accessible parking spaces. Since there is no

history of consequences for NRLEV users parking in designated van accessible spaces, it seems NRLEV users are reinforced for doing so. Specifically, both of the designated van accessible parking spaces under observation were closer to the entrance compared to the regular accessible parking spaces, reducing the distance and response cost people need to walk from the parking spaces and the store entrance. Additionally, the designated van accessible parking spaces have larger spaces compared to the regular accessible parking spaces, and makes it easier for people to park there. The factors that contributed to the research question were multiple and complicated with personal and environmental factors.

During the course of the experimental study, the researchers only observed 2 different RLEV parking in the designated van accessible spaces, while the majority of the vehicles were NRLEV. Therefore is it necessary to intervene to increase the availability of the designated van accessible parking spaces for RLEV? The answer is positive. While compared to NRLEV users with accessible parking permits, the group of RLEV users is much smaller. However, the designated van accessible parking is still very important to them. The relative smaller number of RLEV users cannot justify the ignorance of this problem, especially considering that the ratio of accessible parking spaces of NRLEV to RLEV are greater and that NRLEV users have more options of also choosing regular parking spaces (non-accessible parking spaces). In addition, RLEV users have been increasing and will continue to increase as people age with increasing prevalence of chronic diseases and mobility impairments associated with aging (Crimmins & Beltran-Sanchez, 2011) and RLEV becomes more affordable. According to a sales manager on accessible van company, the accessible van sales data for 6 Midwest states increased by 54.34% (760 in 2012 and 1173 in 2014) (Keith Carlson, personal communication, January 15, 2015).

This explorative study investigated the problem using mixed methods approach, incorporating both qualitative and quantitative methods. It provides preliminary data to start addressing this undetected issue. The main conclusions obtained from the entire study included (a) the designated van accessible parking space being taken by NRLEV users was a big concern to RLEV users' independence and safety, (b) the standard signage for designated van accessible parking was not effective in prompting drivers with accessible parking permits or license plates to park in the right space, (c) the intervention van accessible parking signs had small to moderate effects on reducing non-ramp or lift equipped van users using designated an accessible parking spaces, and increasing availability of designated van accessible parking spaces, and (d) reinforcement for parking in the designated van accessible parking space and no history of consequence of this behavior for NRLEV users is another important factor as to the ineffectiveness of the current designated van accessible parking sign.

One limitation of this explorative study is that the study sample was relatively small, which might be a potential threat to generalization to other settings (e.g., drug store, restaurant parking lots). There are two limitations with the dependent variable, the percentage of NRLEV being deterred by the intervention signs. First, only those who had apparently turned around after seeing the intervention signs were counted, however, we might have missed those who drove by while seeing the intervention signs. In addition, there was no control over the number of vehicles parking in the designated van accessible parking spaces per session in the natural observation, thus the opportunities for deterrence were different across sessions.

The limitations for the study itself and also for the research question in general suggest the need for additional studies. To address this question further, researchers could conduct more focus groups and interviews of both NRLEV users and RLEV users across rural and urban areas.

Intervention studies should be implemented in more diverse settings such as hospital and college campus parking lots to develop a sign that works effectively in general. Researchers could also address this issue through providing empirical evidence to revise public policies to provide a clearer differentiation between regular accessible parking spaces and designated van accessible parking spaces (e.g., different color for NRLEV placard and RLEV placard), along with negative consequences (e.g., fine) for drivers with NRLEV who park in designated van accessible parking spaces. However, there might be potential resistance from NRLEV users with accessible parking permits. Also, in terms of the design of accessible parking spaces, it might reduce the possibility of NRLEV users taking the designated van accessible parking spaces if regular accessible parking spaces could be put closer to the entrance than the van accessible parking spaces. To make the public more mindful, education campaigns could be conducted in the disability community to raise awareness of drivers with disabilities, but do not have significant mobility limitations about courtesy and usage of designated van accessible parking spaces. One possible idea could be to include this as part of the driver's education training for people to get their driver's licenses.

Community participation is listed as one of the health goals for people with disabilities and regarded as a key indicator of successful rehabilitation for people with disabilities by the U.S. Department of Health and Human Services (2011). When people with disabilities are able to drive their own motor vehicle, it increases their level of independence and opportunity to participate in community activities. To participate, one must first arrive, get out, and merge into one's chosen social activity. With an increasing number of accessible parking permits being issued, the availability and considerate use of accessible parking is an essential link to community participation. Decreasing environmental and social barriers to allow RLEV users to

more freely park in designated van accessible parking spaces will create further opportunities for citizens with significant mobility limitations to more fully participate in a safer and more accessible community.

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Table 1

Demographic Information of Focus Group Participants--People with Disabilities

ID	Gender	Age	Primary disability	Years of Disability	Years of driving with an accessible parking permit	Years of driving NRLEV	Years of driving a RLEV	Use of DME	Need of PSA in the van	Number of trips per day	Enter /exit van
1	M	68	partial leg paralysis	13	13	11	2	walker	NO	6	YES
2	F	49	sacral agenesis	49	33	9	24	power wheelchair	NO	4+	YES
3	F	47	paraplegic	28	28	0	4	manual wheelchair	NO	4	YES
4	F	63	myasthenia gravis	25	16	5	11	power wheelchair and walker	NO	2-4	YES
5	M	62	paraplegic	3.5	2	0	2	manual wheelchair	NO	4	YES
6	M	62	paraplegic	45	45	37	8	manual wheelchair	NO	2-5	YES
7	F	35	paraplegic	7	7	7	3	power wheelchair	YES	3	YES*
8	M	31	paraplegic	5	5	0	5	manual wheelchair plus power assist wheels	NO	6-8	YES
9	M	49	paraplegic	28	27	6	11	power wheelchair	YES	3	NO
10	F	34	cerebral palsy plus intellectual disability	34	24	24	1	manual wheelchair plus power wheelchair	YES	4/week	NO

Note. * No for minivan, yes for E350, a full-sized van.

Table 2

Demographic Information of Focus Group Participants--People without Disabilities

Id	Gender	Age	Have a disability or not	Years of driving with an accessible parking permit	Years of driving a RLEV	Number of trips per day
1	F	69	NO	25	11	3
2	M	35	NO	7	7	3

Table 3

Focus Group Transcribed Data Coding

Categories	Sub-categories	Sample quotes
Barriers to finding van accessible parking spaces	Designated van accessible parking spaces being taken by NRLEV	I go to the basketball games or whatever, maybe an hour ahead of time, cause all the van spaces are taken by non-van vehicles. (Ray)
	Rarity of designated van accessible parking spaces	I go a variety of places, restaurants, doctor offices, and ….they have to have handicapped spot, but once it is specifically for van, it's rare. (Jack)
	Importance of designated van accessible parking spaces for RLEV users	I like the van with wide grid cause when you come out, you have room to come out of your wheelchair. It seems anybody cross anyway over. So get the narrow grid, you cannot get out when they cross over. So I prefer the van. (Jack)
Coping strategies	Park far away	A lot of times my solution is to park far out and park sideways. (Ken)
	Drop off at the door	I've dropped off at the door. (Dunstan)
	Van with lift coming out at the back	The first thing on the back of my mind was to get a van with the lift coming out at the back cause the lack of parking. In that way, I can park anywhere in any store and be able to load and unload. (Ken)

Table 3

Continued

Categories	Sub-categories	Sample quotes
Reasons of NRLEV users taking the designated van accessible parking spaces	Ineffectiveness of the sign	The fact is that I don't see it very often making a difference. I don't think it's effective at all. It's worded van accessible. So like you said, the wording may make a difference. Not necessarily every time, but I think the sign doesn't make much difference. (Jack)
	Availability and closeness to the entrance	I would often take it because it was available and it would be closer to the door. (Ray)
	Ignorance or lack of understanding	My niece went out with her grandmother, which is not my mother. It's my brother's mother in law. And she has MS, but she is still ambulatory and does quite well. They were parking at the handicapped parking. And she has a minivan. And my niece said, grandma, what are you doing? And she said, well, it is a handicapped van spot. And they said that's not what they mean. And they explained to her, and this is a spot for aunt. She was like, all the time she was parking there. So sometimes it's just, I am sorry to say this, stupidity or ignorance or something. You just don't get it. (Becky)

Table 3 *Continued*

Categories	Sub-categories	Sample quotes
Suggestions	Revision of the current van accessible parking sign	Anyway, I would agree that they need a van only instead of just a van accessible. The same reason. (Steven)
	Separate permit or placard for RLEV	When you get your car tag, you have to fill that out saying what type of vehicle. I actually have been thinking about it a lot since I got this request. I thought like the color coding of the tags and the spots match them, red goes red and blue goes blue. (Becky)
	All large hash mark areas	Yeah, I think I heard that Wichita has their local code. All the accessible parking spaces should be at least 11 feet wide with 5 feet access aisle, so that's 16 feet, which is the van overall width. So that's every spot, therefore if everybody stays within the lines, there should be enough room for lifts come out. Then you don't get this conversation about what's spot are available. That's a good solution. They just changed the law. If they are all 16 feet overall… (Bobby)
	Put van accessible parking spaces further to the entrance than the regular accessible parking spaces	Most people are looking for the closet spot. If the van are close to the entrance, they are gonna use it. (Jack)
	Education campaign	Advertising campaign, an awareness campaign. They do it for everything. (Ken) They need to teach that in the driver's test. (Jane)

Table 4

Evaluation of the Focus Group

Likert type questions (Question 1 to 7, 1 = strongly disagree, 5 = strongly)	M (*n* = 13)
1. The topics discussed were interesting.	4.85
2. The questions were easy to understand.	4.38
3. We were given enough time for discussion.	4.08
4. The facilitators encouraged participation.	4.77
5. The facilitator kept the group focused and on task.	4.38
6. I got a chance to have my say.	4.92
7. I felt that I was listened to.	5
8. Overall, the focus group was (4 = great, 3 = good, 2 = ok, 1 = poor).	3.62
9. The facilitators were (4 = great, 3 = good, 2 = ok, 1 = boring).	3.62

Figures

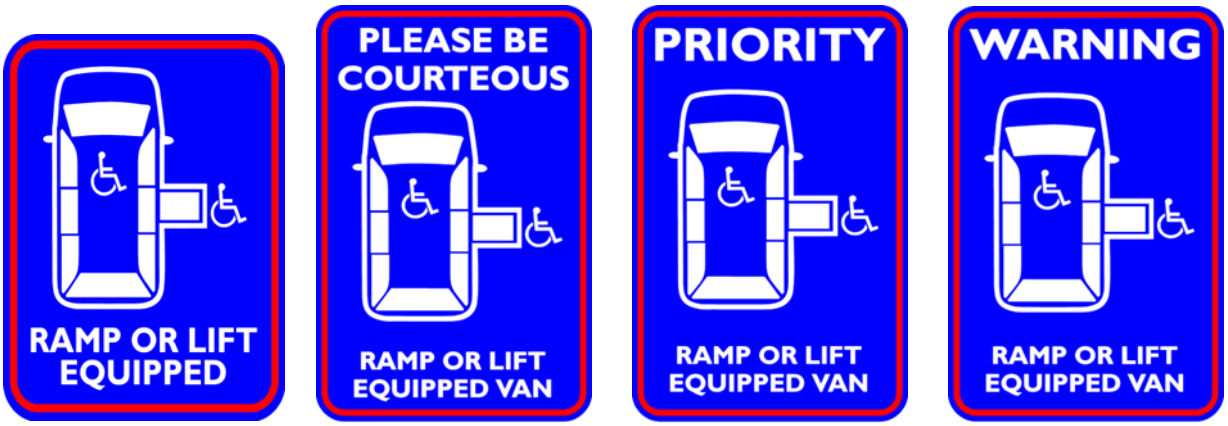
Store A

Store B

Figure 1. Experimental sites.

Regular accessible parking sign Van accessible parking sign (Sign A)

Figure 2. Current accessible parking signs.



Sign B Sign C Sign D Sign E

*Figure 3.*Intervention Signs.

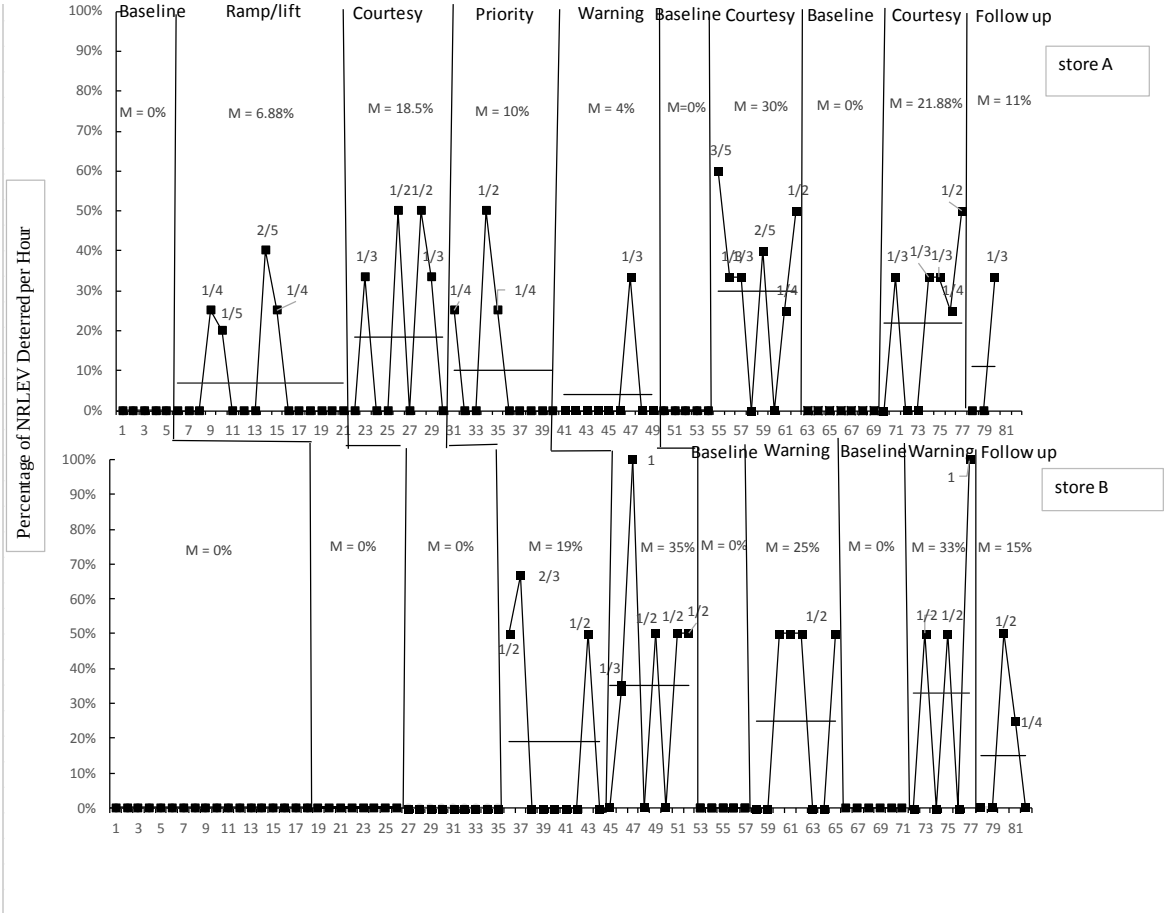


Figure 4. The percentage of deterrence of NRLEV. This figure illustrates the percentage of NRLEV being deterred among all the vehicles intending to park in the designated van accessible parking spaces during a session.

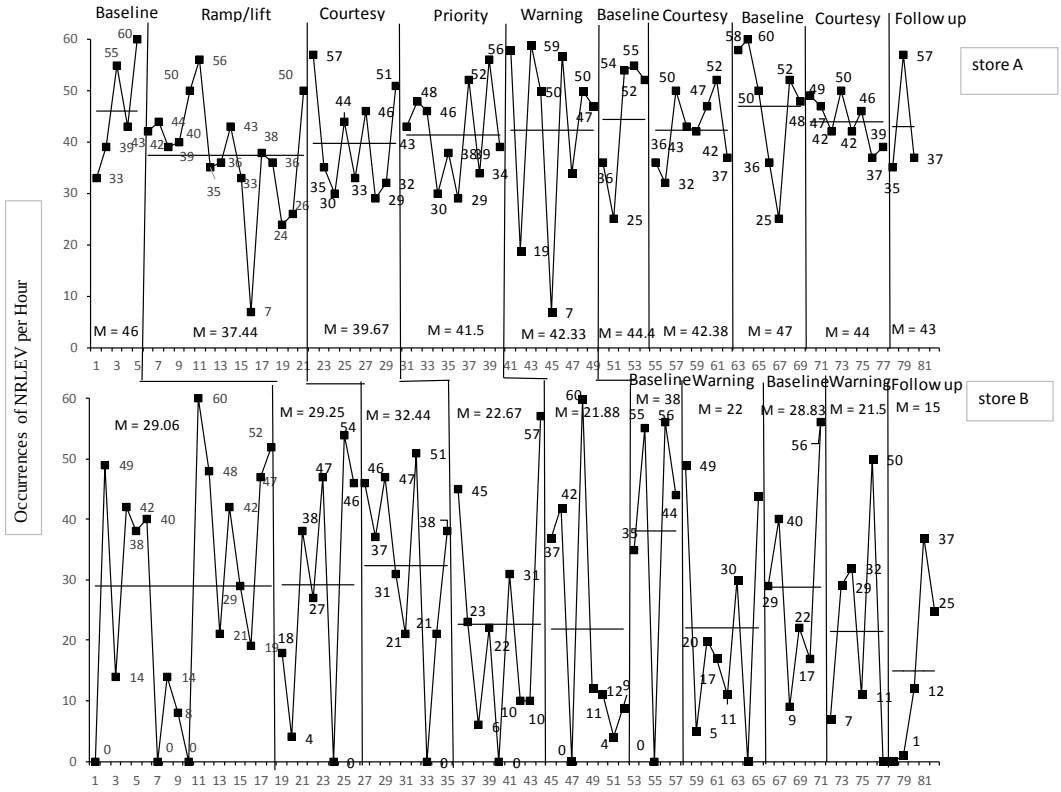


Figure 5. The occurrences of NRLEV parking in designated van accessible spaces per session.

Appendices

Appendix 1

Demographic questionnaire: people with disabilities

1. ___ Male or ___Female?

2. Age ____

3. What is your primary disability? _____

4. How many years have you had your disability? _____

5. How many years have you been driving with an accessible parking permit? _____

6. How many years did you drive a non-ramp/lift equipped vehicle with an accessible parking permit? _____Year(s)

7. How many years have you been driving a ramp/lift equipped van with an accessible parking permit? _____Year(s)

8. Do you use a wheelchair or other assistive technology to get around?

___ manual wheelchair ___ power wheelchair (please check one if applicable)

___ use other assistive device: _____(please specify)

___ do not use a wheelchair or other equipment to get around

9. Do you have a personal assistant while you are in the van? ___ Yes ___ No

10. How many times do you drive per day? _____

11. Can you get in and out of the van by yourself? ___ Yes ___ No

Demographic questionnaire: people without disabilities

1. ___ Male or ___Female?

2. Age ____

3. Are you a driver with a disability? Yes ____ (please state your disability_____)

No _____

4. Do you drive for someone with a disability? Yes____ No____.

5. How many years have you been driving with an accessible parking permit? _____

6. How many years have you been driving a ramp/lift equipped van? _____

7. How many times do you drive per day? _____

Appendix 2

Evaluation survey

Research and Training Center on Community Living

3/11/14 Focus Group

Evaluation

Please rate your satisfaction with the specific aspects of the Focus Group	Strongly Disagree				Strongly Agree
The topics discussed were interesting	1	2	3	4	5
The questions were easy to understand	1	2	3	4	5
We were given enough time for discussion	1	2	3	4	5
The facilitators encouraged participation	1	2	3	4	5
The facilitator kept the group focused and on task	1	2	3	4	5
I got a chance to have my say	1	2	3	4	5
I felt that I was listened to	1	2	3	4	5

Please tick the response you agree with:

Overall, the focus group was.....	☐ Great	☐ Good	☐ OK	☐ Poor
The facilitators were.....	☐ Great	☐ Good	☐ OK	☐ Boring

Was there something you think we should have discussed but didn't?

_____

_____

Any other comments?

_____

_____

_____

Thank you.

Appendix 3

Focus group script

FOCUS GROUP INTRODUCTION

WELCOME

Thanks for agreeing to be part of the focus group. We appreciate your willingness to participate.

INTRODUCTIONS

Moderator; assistant moderator; group members

PURPOSE OF FOCUS GROUPS

The reason we are having the focus group is to learn more about the parking experience of people with disabilities who drive an accessible ramp/lift equipped van. We need your input and want you to share your honest and open thoughts with us.

Here are some ground rules that I want to share with you. If you have any other thoughts beside these, please feel free to speak up.

GROUND RULES

1. WE WANT YOU TO DO THE TALKING.

We would like everyone to participate. I may call on you if I haven't heard from you in a while. However, please make sure that only one person speak at a time.

2. THERE ARE NO RIGHT OR WRONG ANSWERS

Every person's experiences and opinions are important. Speak up whether you agree or disagree. We want to hear a wide range of opinions.

3. WHAT IS SAID IN THIS ROOM STAYS HERE

We want folks to feel comfortable sharing when sensitive issues come up. So please make sure that you keep everything we said today in this room.

4. WE WILL BE TAPE RECORDING THE GROUP AND TAKE SOME PHOTOS OF THE GROUP

We want to capture everything you have to say. We don't identify anyone by name in our report. You will remain anonymous and we will destroy the file once we get the information.

1. How useful are the current accessible van parking spaces?

2. What's your overall experience of driving with a ramp/lift equipped van and finding an available accessible van identified parking space?

3. What do you think about people parking in the accessible van parking identified spaces with a regular car or non-lift/ramp equipped van? (How often does it occur? Where does it happen? How does it affect you? What's your solution?)

4. What's your opinion about the effectiveness of different signs that specifically identify accessible parking and **accessible van parking**?

5. Do you have any suggestions for making van identified parking spaces more available?

6. Are you willing to help participate in a study to do something about this issue (e.g., conducting observations)?

Appendix 4

Interview survey

(Script)Hi Sir or Madam,

Would you be interested in answering a couple of short questions about accessible parking? This interview will take only 2-3 minutes. Do you have a few minutes to answer some questions? (If no), “thanks for your time”. (If yes), “please listen to the following questions about accessible parking and answer them as honestly as possible. By answering the questions, you are consenting to participate in this study. You may stop at any time”.

1. Do you think there are enough accessible parking spaces at this store?
2. Are the accessible parking spaces being enforced so those with license or accessible parking tags can park in them?
3. Could you please indicate which picture is the parking sign in the space you just parked? (Show the participants two pictures of the parking signs of the interview site)

4. What does the “van accessible” sign mean to you in terms of parking?
5. Who do you think should use the “van accessible” sign?
6. Do you think the “van” should be ramp or lift equipped to park in the “van accessible” space?

Appendix 5

Operational Definitions and Scoring Form

Van Accessible Parking	
(NV) Non van	When a designated van accessible space is occupied by a non-ramp/lift vehicle.
(V) Van parking	When a designated van accessible space is occupied by a ramp/lift van.
Regular ADA Parking Space	
(O) Occupied	The regular ADA space is occupied.
Both of Van Accessible and Regular ADA Parking Space	
(---) Available	The van identified space or the regular ADA space is available.
(N) Not available	When the van identified space or the regular ADA space is occupied by objects other than vehicles and is not available for parking (e.g., shopping cart)
(I) Illegal parking	When a van identified or regular ADA space is occupied by a vehicle without a displayed access permit/license.
(×) New vehicle	When a van identified or regular ADA space is occupied by a different vehicle
Diagonal	
D(Diagonal parking)	The vehicle parks over the diagonal lines painted on ramp accessible aisles.
(N) Not available	When the diagonal line area (access aisle) is occupied by any objects (e.g., shopping carts, vehicles).
Note: 1. All spaces are accessible. 2. Parking space = space	

Date:	Observer:	Location:	
Time start:	Time stop:	Condition:	Session number:

Time (minute)	Van Accessible Space	Diagonal		Regular ADA Space	Time (minute)	Van Accessible Space	Diagonal		Regular ADA Space
1					31				
2					32				
3					33				
4					34				
5					35				
6					36				
7					37				

8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				